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NATIONAL AIRSPACE SYSTEM PERFORMANCE AND AVIATION ACTIVITY

This chapter contains a discussion of the performance of the National Airspace System and includes statistics describing current and projected aviation activity at U.S. airports. It summarizes developments in aviation services that may lead to an increase in aviation activity in the future.

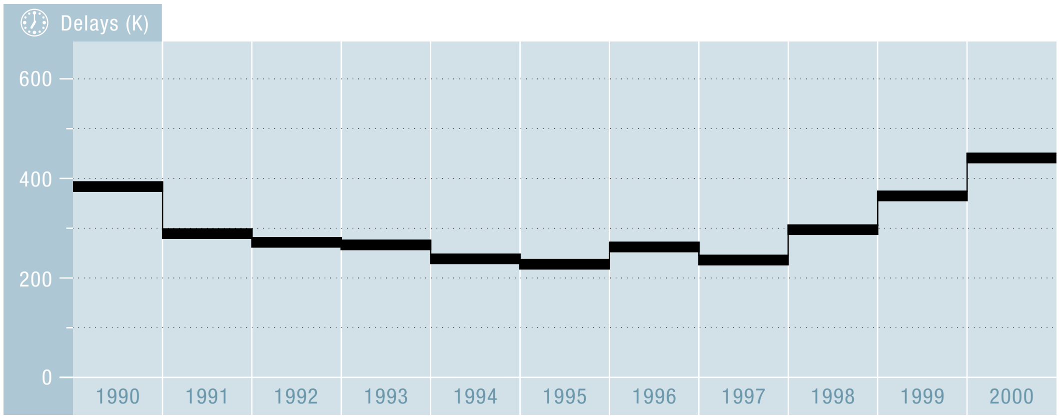
2.1 System Performance

Delay is the traditional measure of NAS performance. However, delays are only a summary measure of the interactions among capacity and demand at airports and in airspace throughout the system. During a given hour, if aircraft using an airport sought service at a continuous rate equal to that at which aircraft operations could be processed, and if operating conditions at the airport were constant throughout the hour, then operations could reach the airport's highest capacity without significant delays. However, the rate at which aircraft arrive and depart is never continuous. There are periods during an hour when several aircraft demand service at the same time and periods when none arrive or depart. Therefore, the number of operations an airport actually processes usually is less than the airport's highest capacity, even when the weather is favorable. As demand approaches airport capacity, some delays related to congestion will occur. However, if demand begins to exceed airport capacity, delays will become more significant and occur at an increasing rate.

2.1.1 Delays Reported by the Operations Network

The FAA reports the delay performance of the NAS every month, using data from its Operations Network (OPSNET). These data come from observations by FAA personnel, who record only aircraft that are delayed by 15 minutes or more during any phase of flight. According to OPSNET data, 450,289 flights were delayed 15 or more minutes in CY 2000, an increase of 20.3 percent over the 374,116 flight delays in CY 1999. Figure 2-1 shows flight delays for the years for which OPSNET data are available.

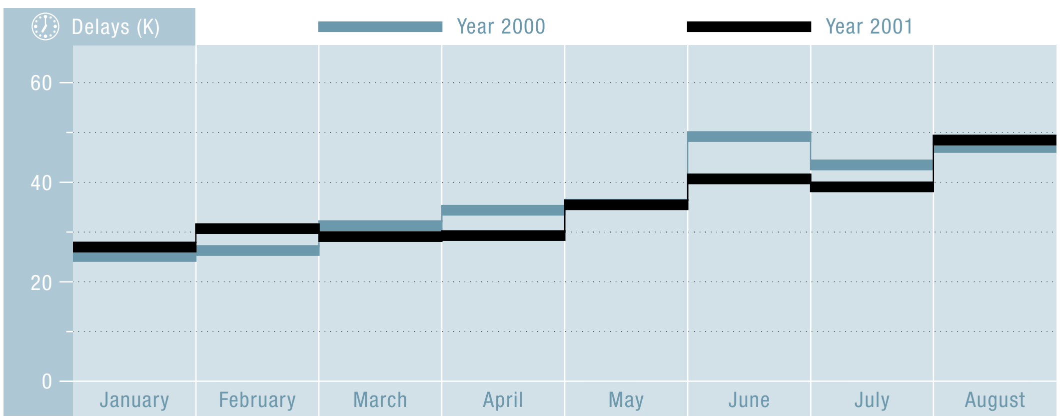
Figure 2-1 Annual Flight Delays CY 1990-CY 2000



4 Congress has directed the FAA and the Department of Transportation's Bureau of Transportation Statistics (BTS) to develop a common system for reporting delays. The FAA and BTS have agreed upon a common definition of delay: a flight will be considered delayed if it arrives at the destination gate 15 minutes or more after its scheduled arrival time. However, the system to track delays using this definition is not yet in place. The 2002 ACE Plan will report on these changes and provide data on delays from the new measurement system.

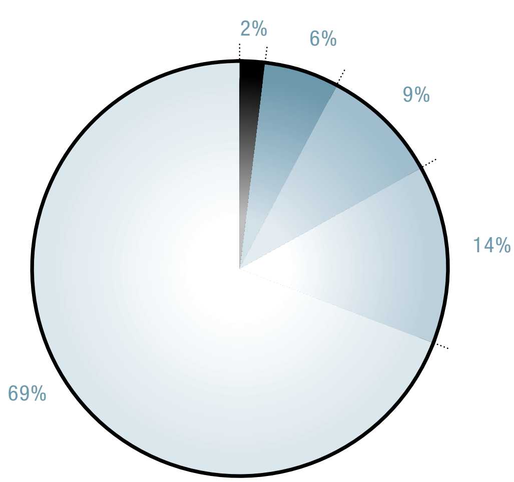
However, the negative trend of recent years was reversed in 2001. Not only have the double-digit increases in delays stopped, but beginning in March 2001 the number of delays declined for every month except August. From April – June 2001, delays declined by 11.21 percent compared to the same period in the previous year. During June, July, and August, when convective weather disrupts many operations, delays were down by 7.99 percent from the previous summer. The FAA attributes these improvements to the efforts of the airports, the airlines, and the FAA to address airport and airspace congestion, as well as a slight improvement in the weather during the summer. Figure 2-2 shows the number of delays, by month, from January through August 2000 with comparable data for 2001. For the eight month period, delays declined by 4.16 percent.

Figure 2-2 Delays By Month, January-August 2000 and 2001



One of the most valuable aspects of the OPSNET system is that it attributes each delay to one of several causal factors: weather, traffic volume, NAS equipment outages, closed runways, and other causes. The primary causes of delay have varied little year over year, with a large majority of delays attributed to weather (from 65 to 75 percent) and a smaller but significant percentage to traffic volume (12 to 22 percent.) Figure 2-3 shows the distribution of delays by cause for CY 2000.

Figure 2-3 Flight Delays by Cause CY 2000



2%	Equipment
6%	Runway
9%	Other
14%	Volume
69%	Weather

2.1.2 The Aviation System Performance Metrics System

The FAA is developing a new delay measurement system in cooperation with the Department of Transportation and the airlines called the Aviation System Performance Metrics (ASPM) system. This system will replace the Consolidated Operations and Delay Analysis System (CODAS) system, which has been discussed in the ACE Plan in recent years.

In November 1999, the FAA, the Air Transport Association and a number of air carriers agreed to share data so that a common set of performance metrics could be computed. The participants agreed that the metrics would be made available without any attempt to assign causality. Currently, 49 airports comprise the ASPM system.

Ten large air carriers have agreed to provide actual flight times directly to the FAA through ARINC, a private aviation services company, every day. The times on an individual flight that will be provided are the Out, Off, On and In times (OOOI), which are defined as:

- Out is the time that the aircraft departs the gate
- Off is the time that the aircraft departs the runway
- On is the time that the aircraft touches down at the arrival airport runway
- In is the time that the aircraft arrives at the gate

Flight times for four other air carriers are added to the ASPM database once a month, using data that are reported to the Department of Transportation's Bureau of Transportation Statistics. Flight times for all other carriers are estimates. For each individual flight, the OOOI data are merged with data from the FAA's Enhanced Traffic Management System (ETMS) and the Official Airline Guide and are used to compute a number of metrics. The ASPM system is still in development, so the metrics are not yet available to the public. The FAA expects to complete the system in the near future and will then release the metrics each day.

2.2 Aviation Activity in the United States

Aviation activity is the most appropriate measure of demand on airports and air traffic service providers. Aviation activity in the United States comes from a number of diverse participants: large commercial air carriers, regional carriers, on-demand air taxis, commuter airlines, all-cargo airlines, the military, and general aviation operators. These users place different demands upon the airports and air traffic control system, because the magnitude, the distribution, the location and the timing of their activities vary. All commercial activity is conducted under the control of the FAA's air traffic control system, whether the operators are large commercial jets, regional jets, cargo carriers, commuters, or air taxis.

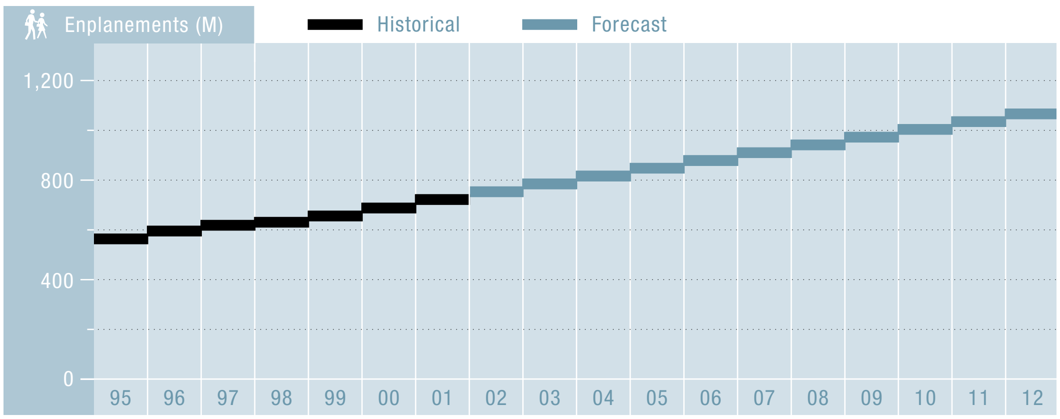
In contrast, the majority of general aviation (GA) activity takes place at small airports far from major urban centers and has little or no contact with the air traffic control system. Much of the contact that GA pilots do have is with the specialists at flight service stations rather than with controllers. Military airfields support most of the military activity and the military's own air traffic control system.

As activity increases, this puts increased pressure on airports and the air traffic control system to provide safe and efficient services. When demand exceeds capacity, either in airspace or at airports, flight operations are disrupted and passengers are delayed.

2.2.1 Passenger Enplanements and Aircraft Operations at U.S. Airports

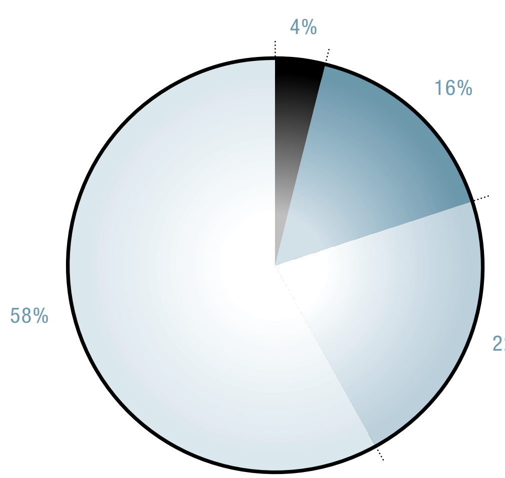
In FY 2000, passenger enplanements grew by 4.4 percent over the previous year, from 666.2 million to 695.7 million, approaching the 700 million levels for the first time.[5] The FAA forecasts that enplanements will top one billion in FY 2010 and reach 1.084 billion in FY 2012, an increase of 55.8 percent over today's level. Figure 2-4 shows the growth in passenger enplanements from FY 1995 and the FAA forecasts for FY 2001 through FY 2012.

Figure 2-4 Passenger Enplanements FY 1995-FY 2012



Passenger enplanements apply only to commercial operations, but the FAA tracks aircraft operations for four classes of users that conduct operations at U.S. airports: air carriers, air taxis/commuters, general aviation, and the military. Figure 2-5 shows aircraft operations by user group for FY 2000. General aviation operators accounted for the large majority of aircraft operations, with air carrier and air taxi/commuters accounting for most other operations. Military operations made up a small fraction of aircraft operations.

Figure 2-5 Aircraft Operations by User Group FY 2000

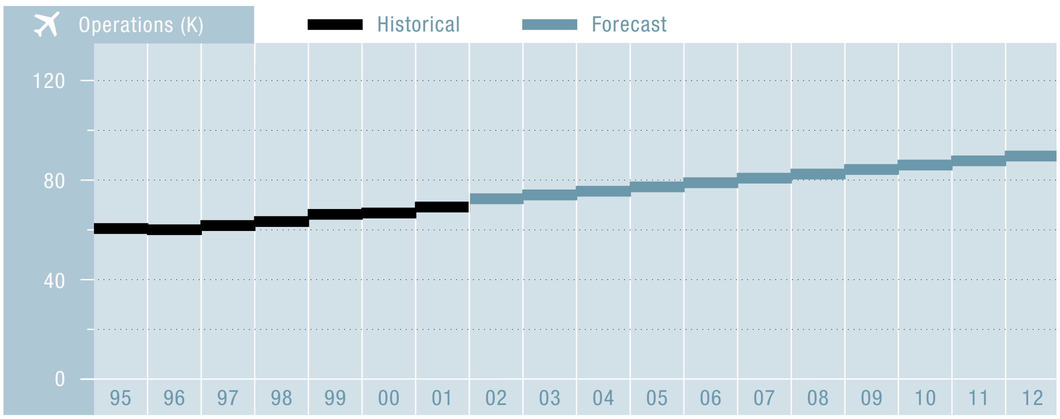


4%	Military
16%	Air Taxi/Commuter
22%	Air Carrier
58%	General Aviation

5 The ACE Plan generally uses fiscal year (FY) numbers for enplanements and operations so that they can be compared with the FAA's forecasts, which are available only for fiscal years. The data in this section and in the accompanying tables are from the FAA Aerospace Forecasts 2001-2012, March 2001, Table 11, and some data have been updated by the Office of Aviation Policy and Plans, Statistics and Forecast Branch.

Aircraft operations for all users increased slightly in FY 2000, rising from 68.1 million to 68.7 million operations. However, the rates of growth for the four user groups varied significantly: air carrier operations increased by 3.94 percent and air taxi/commuter operations increased by 1.75 percent, while general aviation operations decreased by 0.48 percent and military operations decreased by 1.12 percent. The FAA forecasts aircraft operations to increase significantly in the future, reaching 91.5 million for all users in FY 2012, an increase of 33.2 percent over today's level. Figure 2-6 shows the growth in aircraft operations, for all users, from FY 1995 through FY 2000 and FAA forecasts from FY 2001 through FY 2012.

Figure 2-6 Aircraft Operations, All Users FY 1995-FY 2012



The projected growth rate for aircraft operations differs for the various user groups. For the 12-year period, the FAA forecasts air carrier operations to increase by 43.6 percent, substantially faster than the overall rate.

2.2.2 Enplanements and Operations at the 100 Busiest Airports

Because of the concentration of commercial traffic at the largest airports and the dispersion of general aviation operations, the 100 busiest airports, as ranked by passenger enplanements, accounted for more than 96 percent of passenger enplanements but only 42 percent of aircraft operations in FY 2000. The number of passenger enplanements at the 100 busiest airports increased from 634.8 million in FY 1999 to 650 million in FY 2000, a 2.4 percent increase. In the same period, aircraft operations at those 100 airports increased by 3.2 percent, from 18.5 to 19.1 million. The FAA forecasts that enplanements at those airports will grow to 1.049 billion and that operations for all user groups will increase to 28 million by FY 2012.

Passenger enplanements for the 100 busiest airports (ranked by CY 2000 enplanements), by both fiscal and calendar year for the past three years are shown in Appendix B-1. The FAA forecasts and rates of growth for these same airports for FY 2012 are presented in Appendix B-2. Aircraft operations for all user groups for the same 100 airports (ranked by CY 2000 enplanements), by both fiscal and calendar year for the past three years are shown in Appendix B-3. The FAA forecast and rates of growth for those airports for FY 2012 are presented in Appendix B-4.

2.2.3 General Aviation Activity

General aviation (GA) includes all segments of the aviation industry except commercial air carriers and the military. The majority of U.S. airports handle only GA traffic. Many of these are small rural airports; flights to and from those airports have little or no contact with the FAA's air traffic control system and don't affect airspace or airport capacity. However, in FY 2000, there were almost 40 million GA operations recorded at airports with FAA and contract towers, well over 50 percent of total aircraft operations. These aircraft operations did use the air traffic control system and added to the mix of traffic at those airports.

Figure 2-7 lists the airports with FAA and contract towers with the largest number of general aviation aircraft operations. Six of these airports are primary commercial service airports, while four are relievers, general aviation airports designated to provide an alternative to commercial service airports in major metropolitan areas.

Figure 2-7 Airports With The Most General Aviation Operations FY 2000

Airport (ID)	City/State	Airport Type	Operations	Based Aircraft
Van Nuys (VNY)	Van Nuys, CA	Reliever	518,682	812
Daugherty Field (LGB)	Long Beach, CA	Primary	392,747	426
Denver Centennial (APA)	Denver, CO	Primary	382,443	702
Orlando Sanford (SFB)	Orlando, FL	Primary	363,268	299
Daytona Beach (DAB)	Daytona Beach, FL	Primary	358,425	184
Phoenix-Deer Valley (DVT)	Phoenix, AZ	Reliever	343,933	835
Oakland-Pontiac (PTK)	Pontiac, MI	Reliever	336,091	816
E.A. Love Field (PRC)	Prescott, AZ	Primary	325,061	323
Meacham International (FTW)	Ft. Worth, TX	Reliever	318,566	442
John Wayne (SNA)	Santa Ana, CA	Primary	312,627	651

General aviation also has a significant presence at the largest commercial service airports. Figure 2-8 shows that GA traffic accounted for 9.83 percent of total aircraft operations at the thirty-one large-hub airports in FY 2000. The actual percentages of general aviation operations varied from just 1.25 percent at Seattle-Tacoma to 30.58 percent at Ft. Lauderdale.

Figure 2-8 GA Activity at Large-Hub Airports in FY 2000

Airport (ID)	General Aviation Operations	Total Operations	% General Aviation Operations
Ft. Lauderdale-Hollywood International (FLL)	87,787	287,094	30.58
Honolulu International (HNL)	89,510	343,296	26.07
Minneapolis-St. Paul international (MSP)	128,497	524,261	24.51
Las Vegas McCarran International (LAS)	119,100	535,935	22.22
Salt Lake City International (SLC)	81,312	369,343	22.02
Phoenix Sky Harbor International (PHX)	116,389	624,261	18.64
Ronald Reagan National (DCA)	60,255	344,092	17.51
Tampa International (TPA)	47,002	277,888	16.91
Miami International (MIA)	78,379	516,009	15.19
Washington Dulles International (IAD)	62,003	495,717	12.51
Detroit Metropolitan Wayne County (DTW)	69,154	561,123	12.32
Philadelphia International (PHL)	58,802	484,963	12.13
Charlotte/Douglas International (CLT)	55,241	458,697	12.04
Baltimore-Washington International (BWI)	34,012	309,535	10.99
Orlando International (MCO)	32,727	367,367	8.91
San Diego International Lindberg Field (SAN)	16,713	208,894	8.00
Newark International (EWR)	18,285	458,677	6.99
Boston Logan International (BOS)	33,921	510,113	6.65
Greater Cincinnati International (CVG)	32,160	485,001	6.63
San Francisco International (SFO)	28,061	437,763	6.41
Greater Pittsburgh International (PIT)	25,522	449,168	5.68
George Bush International (IAH)	27,081	483,806	5.60
Dallas-Fort Worth International (DFW)	47,241	875,673	5.39
Lambert St. Louis International (STL)	23,730	489,529	4.85
New York LaGuardia (LGA)	17,472	378,018	4.62
New York John F. Kennedy International (JFK)	12,561	358,977	3.50
Chicago O'Hare International (ORD)	28,162	906,326	3.11
Denver International (DEN)	15,565	520,882	2.99
Hartsfield Atlanta International (ATL)	25,285	922,016	2.74
Los Angeles International (LAX)	18,438	781,418	2.36
Seattle-Tacoma International (SEA)	5,576	444,630	1.25
Total Large-Hub Airports	**1,495,943**	**15,210,472**	**9.83**

2.2.4 Air Cargo Activity

There are two types of air cargo carriers: combination carriers that carry passengers in the main body of the aircraft and freight in the belly (along with passengers' baggage) and all-cargo carriers that transport freight but do not carry passengers. The FAA has forecast that air cargo traffic would grow at 5.7 percent annually from FY 2000 through FY 2012. Cargo traffic tends to track economic activity and future traffic is expected to follow the recovery of the economy.

Figure 2-9 shows the amount of cargo loaded and unloaded, in thousands of metric tons, at the ten busiest airports for the past three calendar years, rank by CY 2000 tonnage, and the percentage change from 1999 to 2000.

Figure 2-9 Cargo Loaded and Unloaded at the Ten Busiest Airports CY 2000 (thousands of metric tons)

Airport (ID)	1998	1999	2000	% Change Over 1999
Memphis International (MEM)	2,369	2,412	2,489	3.2
Los Angeles International (LAX)	1,861	1,969	2,039	3.6
John F. Kennedy International (JFK)	1,604	1,728	1,818	5.2
Anchorage International (ANC)	1,289	1,657	1,804	8.9
Miami International (MIA)	1,793	1,651	1,643	(0.8)
Louisville International (SDF)	1,395	1,440	1,519	5.5
Chicago O'Hare International (ORD)	1,402	1,481	1,469	(0.8)
Indianapolis International (IND)	813	1,041	1,165	11.9
Newark International (EWR)	1,094	1,093	1,082	(1.0)
Dallas/Ft. Worth International (DFW)	N/A	830	905	9.0

Source: Airports Council International – North America

2.3 Other Sources of Aviation Activity

The FAA forecasts robust growth for all current sources of aviation activity. In addition, a number of developments in the aviation industry may have a long-term impact on the demand for airport and airspace capacity. These include the continuing growth in the use of regional jets, the development of new large aircraft and the proposed development of the Boeing sonic cruiser. Each of these is discussed in the following section.

2.3.1 Update on Regional Jets

During 2000, regional jets continued to be one of the most dynamic sectors of the aviation industry. Most aviation analysts and the FAA expect the size of the regional jet fleet, the number of regional jet operations, and the number of airports they serve to grow rapidly.

In FY 2000, the regional airlines enplaned 79.6 million passengers. The FAA projects that regional carrier's system-wide enplanements (which includes both turboprop and jet operations) to increase by 5.6 percent annually through FY 2012. Growth in regional jet enplanements and operations may be substantially higher at some airports because of local circumstances, such as the construction of new runways and shifting airline schedules.

Most of regional carriers' growth will come from an increase in the use of regional jets. The proportion of the regional carriers' traffic provided by regional jets continues to increase as they jets replace turboprops and as larger regional jets, with seating capacity exceeding 50, are introduced. The increased use of regional jets is also expected to increase the average seating capacity of the regional fleet and the average passenger trip length for these carriers. The FAA forecasts that the number of regional jets in service will increase from 569 in FY 2000 to 2,190 in FY 2012.

2.3.2 New Large Aircraft

Airbus is building a new large aircraft (NLA) called the A380, which will have a minimum of 555 seats and a range of 8,000 nautical miles. The first passenger A380 is expected to go into operation in 2006, with the cargo version, the A380-800F, following in March 2008. To date, seven non-U.S. carriers have placed orders for passenger and freighter aircraft, while one U.S. carrier has ordered freighters. Airbus predicts that 360 A380s will be in service by 2009 and another 1,235 by 2019. In recognition of the potential benefits of using fewer but larger aircraft to transport passengers, the FAA is actively engaged in determining the structural and operational changes that will be required to accommodate NLAs at U.S. airports. The FAA's NLA Facilitation Group, composed of representatives from the FAA, aircraft manufacturers, airports and various aviation industry associations, has been evaluating such issues as airport design standards, airport rescue and firefighting requirements, and wake vortex separation standards.

Airports with at least two daily Boeing 747 flights are the most likely candidates for early A380 service. These include New York Kennedy, Miami, Los Angeles, and San Francisco. In addition, Memphis is a likely early A380 airport, since FedEx, which has its hub there, has ordered a number of A380 freighters.

In 1970, the FAA upgraded its airport standards and guidance materials to accommodate the Boeing 747, which was larger than other aircraft in operation at that time. Now, thirty years later, the development of NLAs has caused airport design standards to come under scrutiny again. Only a few U.S. airports have been built to, or have had a portion of their airfield built to Design Group VI standards, capable of handling large aircraft such as the A380.

In 1998, the Airports Council International-North America surveyed the major U.S. airports regarding the construction costs of bringing NLAs to their airports. Los Angeles and New York Kennedy, two of the likely candidates for early A380 service, each estimated that it would cost more than $100 million to make the runway and taxiway modifications necessary to accommodate NLAs using current Design Group VI standards. Terminal and apron modifications would push the costs even higher. Accommodating the A380 at Design Group V airports would require additional modifications, such as restricting traffic on adjacent runways or taxiways.

In addition, the high second deck of the A380 presents logistical difficulties under existing aircraft rescue, fire fighting and other emergency procedures. The FAA is reviewing current provisions of Federal Aviation Regulation Part 139 that address these procedures. Finally, because wake vortex effects are generally proportional to aircraft weight, the A380 will produce greater wake vortices than existing aircraft, requiring a modification in separation standards for following aircraft. The FAA has proposed that the manufacturers conduct studies to determine the wake vortex characteristics of NLAs.

2.3.3 Sonic Cruisers

Boeing forecasts a much smaller market for NLAs than Airbus and has dropped its plans for such an aircraft. Instead, Boeing is developing a smaller but faster aircraft dubbed the "sonic cruiser," which is targeted at point-to-point markets rather than the large hub airports that are the focus of the A380 effort.

The sonic cruiser will seat between 100 and 300 passengers and fly at speeds from Mach .95 to Mach .98, or 95 to 98 percent of the speed of sound (the speed of sound varies by altitude and temperature, so Mach percentages are more accurate; it is 740 miles per hour at sea level and 59 degrees Fahrenheit). The sonic cruiser will also fly at higher altitudes than current jets, cruising above 40,000 feet. A near-sonic jet would not produce the loud sonic booms that result when jets exceed the speed of sound.

The fastest subsonic jetliner in operation is the Boeing 747-400, which has a cruise speed of Mach .85, about 560 miles per hour at 35,000 feet. Boeing estimates that the sonic cruiser will reduce travel times by about an hour for every 3,000 miles flown, an improvement of 10 to 15 percent. This would result in a time savings of 50 minutes on a New York-London flight, typically seven hours now, and as much as 115 minutes on a Singapore-London flight, about 14 hours now. Boeing has said that the new aircraft could be produced as soon as 2007.